

CLAIMS

1. Electro-stimulation apparatus, comprising electric-pulse generating means arranged to generate pulses having preset values of typical parameters, applying means arranged to
5 apply a sequence of said pulses to an organism, said sequence comprising an initial pulse and a final pulse, characterised in that, it further comprises variation means arranged to perform a substantial variation of at least one typical parameter at a moment comprised between
10 said initial pulse and said final pulse.
2. Apparatus according to claim 1, wherein said variation means comprises means for causing a sudden decrease in the value of said at least one typical parameter.
3. Apparatus according to claim 2, wherein said generation
15 means comprises means for causing a gradual increase in the value of said at least one typical parameter, before said sudden decrease.
4. Apparatus according to claim 3, wherein during said gradual increase progressive increments of said at least
20 one typical parameter are provided, said progressive increments being smaller than said sudden decrease by an order of magnitude.
5. Apparatus according to any one of claims 2 to 4, wherein said generation means comprises means for causing a
25 further gradual increase in the value of said at least one typical parameter, after said sudden decrease.
6. Apparatus according to any one of the preceding claims, wherein said variation means comprises means arranged to vary the frequency of said pulses.
- 30 7. Apparatus according to claim 6, wherein said variation means causes a frequency variation of at least 20 Hz.
8. Apparatus according to claim 7, wherein said variation means causes a frequency variation greater than 40 Hz.

9. Apparatus according to claim 8, wherein said variation means causes a frequency variation greater than 60 Hz.
10. Apparatus according to any one of the preceding claims, wherein said variation means is so configured as to
5 actuate said substantial variation when a spasm condition of a muscle stimulated in said organism is reached.
11. Apparatus according to any one of the preceding claims, wherein said variation means is so configured as to actuate said substantial variation when a frequency is
10 reached at which a major release of growth factors, particularly of VEGF, occurs.
12. Apparatus according to any one of the preceding claims, wherein said generating means is so arranged as to generate within said sequence first pulses having a
15 gradually increasing frequency according to a first increment, and second pulses having a gradually increasing frequency according to a second increment, said second increment being greater than said first increment.
13. Apparatus according to claim 12, wherein said second
20 increment is greater by an order of magnitude than said first increment.
14. Apparatus according to claim 12, or 13, wherein said sequence comprises, between said first pulses and said second pulses, an intermediate series of pulses with a
25 substantially constant frequency.
15. Apparatus according to claim 14, wherein said intermediate series comprises pulses having a pulse width oscillating between a maximum and a minimum value, said maximum value being substantially equal to twice said minimum value.
- 30 16. Apparatus according to any one of the preceding claims, wherein after said variation said at least one typical parameter remains constant for a number of sub-phases.
17. Apparatus according to any one of the preceding claims, wherein said generating means is arranged to generate a

further sequence of electrical pulses after said sequence, so that said variation is repeated more than once.

18. Apparatus according to any one of the preceding claims, wherein said variation means comprises means arranged to vary the width of said pulses.
19. Apparatus according to claim 18, wherein said variation means is so configured as to increase the width of said pulses by applying percentage increments of the current width value.
20. Apparatus according to claim 19, wherein said percentage increments are selected from a group consisting of: 20% of the current width value, 25% of the current width value, 33% of the current width value, 50% of the current width value.
21. Apparatus according to claim 19, or 20, wherein between a percentage increment and the subsequent percentage increment a time interval occurs which is randomly selected.
22. Apparatus according to claim 21, wherein said time interval can be varied between 15 s and 60 s.
23. Apparatus according to any one of claims 18 to 22, wherein the width of said pulses is increased up to a maximum value of about 90-100 μ s.
24. Apparatus according to any one of the preceding claims, wherein said sequence is defined by parameters selected from a group consisting of: the sequence in Figure 1, the sequence in Figure 2, the sequence in Figure 3, the sequence in Figure 8 and 9.
25. Method of electro-stimulating an organism, comprising generating a sequence of electric pulses having preset values of typical parameters, said sequence comprising an initial pulse and a final pulse, and applying said sequence to said organism, characterised in that, said generating comprises considerably varying at least one

typical parameter at a moment comprised between said initial pulse and said final pulse.

26. Method according to claim 25, wherein said varying comprises suddenly decreasing the value of said at least one typical parameter. .
27. Method according to claim 26, wherein said generating comprises gradually increasing the value of said at least one typical parameter, before said suddenly decreasing.
28. Method according to claim 27, wherein during said gradually increasing progressive increments of said at least one typical parameter are applied, said progressive increments being smaller than the decrease applied during said suddenly decreasing by an order of magnitude.
29. Method according to any one of claims 26 to 28, wherein said generating comprises further gradually increasing the value of said at least one typical parameter, after said suddenly decreasing.
30. Method according to any one of claims 25 to 29, wherein said varying comprises modifying the frequency of said pulses.
31. Method according to claim 30, wherein said modifying causes a frequency variation of at least 20 Hz.
32. Method according to claim 31, wherein said modifying causes a frequency variation greater than 40 Hz.
33. Method according to claim 32, wherein said modifying causes a frequency variation greater than 60 Hz.
34. Method according to any one of claims 25 to 33, wherein said varying occurs when a spasm condition of a muscle stimulated is reached in said organism.
35. Method according to any one of claims 25 to 35, wherein said varying takes place when a frequency is reached at which a major release of growth factors, particularly of VEGF, occurs.

36. Method according to any one of claims 25 to 35, wherein said generating comprises providing within said sequence first pulses having a gradually increasing frequency according to a first increment, and second pulses having a gradually increasing frequency according to a second increment, said second increment being greater than said first increment.
37. Method according to claim 36, wherein said second increment is greater by an order of magnitude than said first increment.
38. Method according to claim 36, or 37, wherein said sequence comprises, between said first pulses and said second pulses, an intermediate series of pulses with a substantially constant frequency.
39. Method according to claim 38, wherein said intermediate series comprises pulses having a width oscillating between a maximum and a minimum value, said maximum value being substantially equal to twice said minimum value.
40. Method according to any one of claims 25 to 39, wherein after said varying, said at least one typical parameter is kept constant for a number of sub-phases.
41. Method according to any one of claims 25 to 40, wherein said generating comprises further generating a further sequence of electrical pulses, so that said varying is repeated more than once.
42. Method according to any of claims 25 to 41, wherein said varying comprises modifying the width of said pulses.
43. Method according to claim 42, wherein said modifying comprises increasing the width of said pulses by applying percentage increments of the current width value.
44. Method according to claim 43, wherein said percentage increments are selected from a group consisting of: 20% of the current width value, 25% of the current width value,

33% of the current width value, 50% of the current width value.

45. Method according to claim 44, wherein between a percentage increment and the subsequent percentage increment a time interval occurs which is randomly selected.
46. Method according to claim 45, wherein said time interval can be varied between 15 s and 60 s.
47. Method according to any one of claims 42 to 46, wherein the width of said pulses is increased up to a maximum value of about 90-100 μ s.
48. Method according to any one of claims 25 to 47, wherein said sequence is defined by parameters selected from a group consisting of: the sequence in Figure 1, the sequence in Figure 2, the sequence in Figure 3, the sequence in Figures 8 and 9.
49. Support readable by data processing means, containing a plurality of data with preset values of typical parameters, said data being intended to originate a sequence of electric pulses to be applied to an organism by means of electro-stimulation techniques, said sequence comprising an initial pulse and a final pulse, characterised in that, a substantial variation of at least one typical parameter is provided in said sequence at a moment comprised between said initial pulse and said final pulse.
50. Support according to claim 49, wherein said variation comprises a sudden decrease in the value of said at least one typical parameter.
51. Support according to claim 50, wherein said sequence comprises a gradual increase in the value of said at least one typical parameter, before said sudden decrease.
52. Support according to claim 51, wherein during said gradual increase progressive increments of said at least one typical parameter are provided, said progressive

increments being smaller than said sudden decrease by an order of magnitude.

53. Support according to any one of claims 50 to 52, wherein said sequence comprises a further gradual increase in the value of said at least one typical parameter, after said sudden decrease.
54. Support according to any one of claims 49 to 53, wherein said variation comprises a sudden change in the frequency of said pulses.
55. Support according to claim 54, wherein said sudden change is of at least 20 Hz.
56. Support according to claim 55, wherein said sudden change is greater than 40 Hz.
57. Support according to claim 56, wherein said sudden change is greater than 60 Hz.
58. Support according to any one of claims 49 to 57, wherein said variation is provided when said at least one typical parameter reaches a value that causes a condition of spasm of a stimulated muscle in said organism.
59. Support according to any one of claims 49 to 58, wherein said variation is provided when said at least one typical parameter reaches a value at which a major release of growth factors, particularly of VEGF, occurs.
60. Support according to any one of claims 49 to 59, wherein said sequence comprises first pulses with a gradually increasing frequency according to a first increment, and second pulses with a gradually increasing frequency according to a second increment, said second increment being greater than said first increment.
61. Support according to claim 60, wherein said second increment is greater by an order of magnitude than said first increment.
62. Support according to claim 60, or 61, wherein said sequence comprises, between said first pulses and said

second pulses, an intermediate series of pulses with a substantially constant frequency.

63. Support according to claim 62, wherein said intermediate series comprises pulses having a pulse width oscillating
5 between a maximum and a minimum value, said maximum value being substantially equal to twice said minimum value.
64. Support according to any one of claims 49 to 63, wherein after said variation said at least one typical parameter remains constant for a number of sub-phases.
- 10 65. Support according to any one of claims 49 to 64, containing data that enable a further sequence of electrical pulses to be generated after said sequence, so that said variation is repeated more than once.
66. Support according to any of claims 49 to 65, wherein said
15 variation comprises a sudden change in the width of said pulses.
67. Support according to claim 66, wherein said width is increased by applying percentage increments of the current width value.
- 20 68. Support according to claim 67, wherein said percentage increments are selected from a group consisting of: 20% of the current width value, 25% of the current width value, 33% of the current width value, 50% of the current width value.
- 25 69. Support according to claim 64, or 65, wherein between a percentage increment and the subsequent percentage increment a time interval occurs which is randomly selected.
70. Support according to claim 69, wherein said time interval
30 can be varied between 15 s and 60 s.
71. Support according to any one of claims 66 to 70, wherein the width of said pulses is increased up to a maximum value of about 90-100 μ s.

72. Support according to any one of claims 49 to 71, wherein
said sequence is defined by parameters selected from a
group comprising: the sequence in Figure 1, the sequence
in Figure 2, the sequence in Figure 3, the sequence in
5 Figs 8 and 9.